REMARKS

The final Office Action of September 21, 2007 has been reviewed and the Examiner's comments carefully considered. The present Amendment amends claims 10, 11, 17 and 18 in accordance with the originally-filed specification. No new matter has been added. The present Amendment also cancels claim 16. Accordingly, claims 10-15, 17 and 18 are currently pending in this application, and claim 10 is in independent form.

35 U.S.C. §112, Second Paragraph Rejection

Claim 11 stands rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Specifically, the Examiner is contending that it is not clear to what (100) of the silicon substrate of (100) orientation is referring.

Claim 11 has been amended to change the language "a silicon substrate of (100) orientation" to "(100) silicon substrate". It is well known in the art, as shown in United States Patent No. 4,191,788 to Harrington, that the (100) in claim 11 refers to a commonly used crystal face orientation in a silicon substrate. Accordingly, the Applicants believe that the above amendment to claim 11 overcomes the Examiner's indefiniteness rejections.

Reconsideration and withdrawal of this rejection are respectfully requested.

35 U.S.C. §103 Rejections

Claims 10-18 stand rejected under 35 U.S.C. §103(a) for obviousness based upon United States Patent No. 5,452,268 to Bernstein (hereinafter "the Bernstein patent"). In view of the above amendments and the following remarks, the Applicants respectfully request reconsideration of these rejections.

Description of the Present Invention

As defined by amended independent claim 10, the present invention is directed to a sound detecting mechanism comprising a pair of electrodes forming a capacitor on a substrate in which one of the electrodes is a back electrode forming perforations therein corresponding to acoustic holes and the other of the electrodes is a diaphragm. A

multilayered assembly is mounted on the substrate. The multilayered assembly is formed of the diaphragm, a sacrificial layer and the back electrode superposed in series by vapor deposition technique. The sacrificial layer is etched relative to the multilayered assembly formed of the diaphragm, the sacrificial layer and the back electrode, thereby defining a void area between the diaphragm and the back electrode with the sacrificial layer remaining at outer peripheral portions of the void area. The back electrode is formed by polycrystal silicon of 5μm to 20μm in thickness. The substrate comprises a single crystal silicon on insulator (SOI) structure wafer including a silicon oxide film or a silicon nitride film formed on a monocrystal silicon substrate and a polycrystal silicon film formed on the silicon oxide film or the silicon nitride film.

As discussed in the Amendment filed June 29, 2007, according to the present invention relating to the presently amended claim 10, the diaphragm (electrode), the sacrificial layer and the back electrode are each comprised of a single film and are superposed by a vapor deposition technique. Therefore, the bonding conditions between these films are very firm and strong. Additionally, while such strong bonding conditions are maintained, the sacrificial layer is etched to form a void area between the diaphragm and the back electrode, with the sacrificial layer remaining at the outer peripheral portions of the void area. Therefore, after the completion of the inventive sound detecting mechanism, the strong bonding is maintained with the sacrificial layer being sandwiched between the diaphragm and the back electrode. As a result, even if the diaphragm is formed relatively thin, the diaphragm can be firmly fixed by the vapor deposition fixation relative to the sacrificial layer and the back electrode. Hence, a sound detecting mechanism having high sensitivity can easily be obtained.

Moreover, since the back electrode is formed by polycrystal silicon of 5μm to 20μm in thickness, the thin diaphragm can be firmly fixed by the thick back electrode via the sacrificial layer. Accordingly, due to high rigidity of the thick back electrode, in addition to the vapor-deposited firm and strong bonding between the diaphragm, the sacrificial layer and the back electrode, there is achieved another advantage of effective restraint of distortion in the diaphragm.

Furthermore, the substrate comprises a single crystal silicon on insulator (SOI) structure wafer including a silicon oxide film or a silicon nitride film formed on a monocrystal silicon substrate and a polycrystal silicon film formed on the silicon oxide film or the silicon nitride film. This feature of the claimed invention allows the silicon oxide film or the silicon nitride film to be used as an etching stop layer when the polycrystal silicon film or any film formed on an external surface thereof is formed on the diaphragm by etching the monocrystal silicon. As a result, the diaphragm may readily have a reduced thickness by selecting the film thickness, thereby providing the sound detecting mechanism with high sensitivity.

Additionally, since the sound detecting mechanism of the present invention requires a multilayered structure, stress acts in a compressing direction caused by the co-efficient of thermal expansion of the films other than the polycrystal silicon film forming the diaphragm with the reference to the co-efficient of thermal expansion of the back electrode (polycrystal silicon). Especially, in case a silicon nitride film is formed on the monocrystal silicon substrate, this silicon nitride film exerts stress in a stretching direction, so that the stress in the compressing direction and the stress in the stretching direction by forming the silicon nitride film balance each other out appropriately, whereby the stress applied to the diaphragm can be alleviated advantageously.

Therefore, the object of the present invention, which is "to provide a rational construction for a sound detecting mechanism having a diaphragm with a required thickness by thickness control and yet restricting distortion of the diaphragm to realize high sensitivity", is achieved.

<u>The Bernstein Patent and Differences Between this Reference and the Claimed Invention</u>

The Bernstein patent is directed to an acoustic transducer with acoustic transducer (10) comprising a perforated member (12) having perforations (13). The perforated member (12) is mounted to an insulating layer (14). The acoustic transducer (10) also includes a diaphragm (16) mounted to substrate (18) (see Fig. 1). The diaphragm (16) and perforated member (12) may be made from material from the group consisting of gold, nickel, copper, iron, silicon, polycrystalline silicon, silicon dioxide, silicon nitride, silicon

carbide, titanium, chromium, platinum, palladium, aluminum, and their alloys (see column 2, lines 57-62).

Unlike the claimed invention, the Bernstein patent fails to teach or suggest a substrate that comprises a single crystal silicon on insulator (SOI) structure wafer including a silicon oxide film or a silicon nitride film formed on a monocrystal silicon substrate and a polycrystal silicon film formed on the silicon oxide film or the silicon nitride film.

More specifically, there is found no arrangement corresponding to the construction of the present invention of "silicon oxide film or silicon nitride film 302" found on the silicon substrate (18) in Fig.1 of the Bernstein patent. Rather, the diaphragm (16) is formed directly on the silicon substrate (18) and, further, the sacrificial layer (14) is formed thereon. Therefore, stress in the compression direction alone will be exerted from the sacrificial layer (14) onto the diaphragm (16), so that distortion will tend to occur in this diaphragm (16). For this reason, it is necessary to isolate the diaphragm disclosed in the Bernstein patent from the substrate by a spring (see elements 54, 56, 58 and 60 in Fig. 2 of the Bernstein patent) in order to free the diaphragm from distortion.

On the other hand, according to the technical concept of the present invention, in order to alleviate stress applied to the diaphragm, the back electrode, the insulator and the diaphragm are stacked and integrated with each other and also by balancing the stress in the compressing direction applied to the diaphragm and the stress in the stretching direction balanced out each other to alleviate distortion. Therefore, the present invention and acoustic transducer disclosed in the Bernstein patent are completely different than each other in the technical concepts thereof.

Additionally, as the Examiner admits, the Bernstein patent fails to teach or suggest a multilayered assembly mounted on the substrate and formed on the diaphragm, a sacrificial layer and the back electrode superposed in series, by vapor deposition technique as required by independent claim 10. Instead, the diaphragm (16) of the Bernstein patent is separated from the substrate (18) and the back electrode (12) by means of springs (54, 56, 58 and 60) (see Fig. 3), instead of being formed as a multilayered assembly as required by independent claim 10.

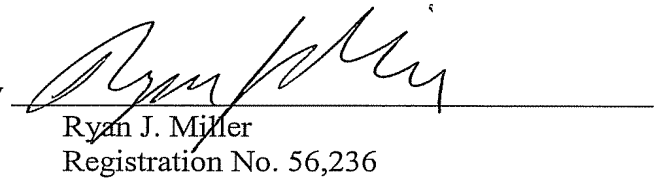
For the foregoing reasons, the Applicants believe that the subject matter of amended independent claim 10 is not rendered obvious by the Bernstein patent. Reconsideration of the rejection of claim 10 is respectfully requested.

Claims 11-15, 17 and 18 depend from and add further limitations to amended independent claim 10 or a subsequent dependent claim and are believed to be patentable for the reasons discussed hereinabove in connection with amended independent claim 10. Reconsideration of the rejection of claims 11-15, 17 and 18 is respectfully requested.

Based on the foregoing amendments and remarks, reconsideration of the rejections and allowance of pending claims 10-15, 17 and 18 are respectfully requested.

Respectfully submitted,

THE WEBB LAW FIRM

By 

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